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CLAIMS

1.   A method for applying a coating on a substrate, wherein, opposite the substrate, at least two expanding thermal plasma (ETP) sources are arranged which provide the substrate with a coating, wherein the substrate is located in a process room in which the pressure is lower than the
5   pressure, prevailing in the ETP sources, of a carrier gas which is introduced into the process room via the sources and which forms the expanding plasma, wherein the coating provided by each source has a layer thickness according to a certain deposition profile, for instance a Gaussian deposition profile, and wherein different process parameters are chosen such that, after
10   the coating process, the addition of the deposition profiles results in a substantially uniform layer thickness of the coating on a relevant part of the substrate, one of the process parameters to be chosen being the distance between sources producing plasma plumes at the same time, this distance being chosen or set such that the expanding plasmas substantially do not
15   influence each other, in the sense that the shapes of the plasma plumes substantially correspond to the shape of a single plasma plume in a corresponding process chamber under otherwise corresponding process conditions.

2.   A method according to claim 1, wherein thickness variations are
20   measured over the surface of the substrate of the layer obtained after the coating process, wherein, subsequently, the process parameters are adjusted for reducing the thickness variations observed.

3.   A method according to claim 1 or 2, wherein the substrate is stationary relative to the sources and wherein the most neighboring sources
25   are switched on in alternation.

4.   A method according to claim 1 or 2, wherein the substrate is moved relative to the sources in a conveying direction, wherein all sources are

switched on at the same time and wherein the mutual distance between neighboring sources is chosen such that the expanding plasmas substantially do not influence each other, in the sense that the shapes of the plasma plumes substantially correspond to the shape of a single plasma

5   plume in a corresponding process chamber, wherein at least one of the sources, viewed in the conveying direction, is arranged behind or in front of the other sources and wherein the positions of the sources in a direction transverse to the conveying direction are such that the neighboring projections of three sources on an imaginary line extending transverse to

10   the conveying direction are such that the projection position of one of the three sources is located in the middle between the other two sources.

5.   A method according to claim 4, wherein three sources are provided which are located on the angular points of an imaginary triangle, wherein two angular points are located on an imaginary line extending transversely

15   to the conveying direction and wherein the third angular point is at equal distances from the other two angular points.

6.   A method according to any one of the preceding claims, wherein one of the process parameters to be chosen, and to be varied depending on the other process parameters, for influencing the resulting layer thickness

20   uniformity is the arc flow of the various ETP sources.

7.   A method according to claims 5 and 6, wherein the arc flow of the source located on the third angular point is chosen to be lower than the arc flows of the other two sources.

8.   A method according to any one of the preceding claims, wherein one

25   of the process parameters to be chosen, and to be varied depending on the other process parameters, for influencing the resulting layer thickness uniformity is the pressure of the carrier gas in the source.

9.   A method according to any one of the preceding claims, wherein one of the process parameters to be chosen, and to be varied depending on the

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other process parameters, for influencing the resulting layer thickness uniformity is the mutual positioning of the sources.

10.   A method according to any one of the preceding claims, wherein one of the process parameters to be chosen, and to be varied depending on the other process parameters, for influencing the resulting layer thickness uniformity is the outflow angle of the plasma plumes relative to the substrate.

11.   A method according to claim 2, wherein the measurement of the layer thickness is performed automatically.

12.   A method according to claim 2, wherein the measurement of the layer thickness is performed by means of an optical measurement.

13.   A method according to claim 2, wherein the measurement of the layer thickness is performed by means of an resistance measurement between two or more points on the layer.

14.   A method according to claim 2, wherein the measurement of the layer thickness is performed by means of a layer thickness gauge.

15.   A method according to claim 2, wherein the measurement of the layer thickness is performed by means of a temperature measurement of the substrate surface.

16.   An apparatus for carrying out the method according to any one of the preceding claims for forming a coating on a substrate, which apparatus is provided with a process chamber enclosing a process room, pumping means for creating an underpressure in the process room, at least two expanding thermal plasma (ETP) sources through which a carrier gas is supplied to the process room, under a higher pressure than the pressure prevailing in the process room, thereby forming an expanding plasma, and a substrate holder for carrying at least one substrate, wherein the coating applied by each source has a layer thickness according to a certain deposition profile, for instance a Gaussian deposition profile, and wherein different process parameters are settable such that, after the coating process, the addition of

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the deposition profiles results in a substantially uniform layer thickness of
the coating on a relevant part of the at least one substrate, one of the
process parameters to be chosen being the distance between sources
producing plasma plumes at the same time, this distance being chosen or

5   set such that the expanding plasmas substantially do not influence each
other, in the sense that the shapes of the plasma plumes substantially
correspond to the shape of a single plasma plume in a corresponding process
chamber under otherwise corresponding process conditions.

17.   An apparatus according to claim 16, wherein the apparatus is

10   provided with a measuring device for measuring the layer thickness
variations over the surface of the substrate, wherein the apparatus is
provided with a control for automatically setting at least a number of the
process parameters to be set depending on the layer thickness variations
measured by the measuring device.

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18.   An apparatus according to claim 16 or 17, wherein the substrate is
stationary relative to the sources and wherein the most neighboring sources
can be switched on in alternation.

19.   An apparatus according to claim 16 or 17, wherein the substrate is

20   arranged movably relative to the sources in a conveying direction, wherein
all sources are switched on at the same time and wherein the mutual
distance between neighboring sources is chosen such that the expanding
plasmas substantially do not influence each other, in the sense that the
shapes of the plasma plumes substantially correspond to the shape of a

25   single plasma plume in a corresponding process chamber, wherein at least
one of the sources, viewed in the conveying direction, is arranged behind or
in front of the other sources and wherein the positions of the sources in a
direction transverse to the conveying direction are such that the
neighboring projections of three sources on an imaginary line extending

30   transverse to the conveying direction are such that the projection position of

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one of the three sources is located in the middle between the other two sources.

20.   An apparatus according to claim 19, wherein three sources are provided which are located on the angular points of an imaginary triangle,

5   wherein two angular points are located on an imaginary line extending transversely to the conveying direction and wherein the third angular point is at equal distances from the other two angular points.

21.   An apparatus according to claim 20, wherein the sources are slidable relative to the process chamber.

10   22.   An apparatus according to claim 21, wherein, for the variant wherein the substrate moves in a conveying direction (T) relative to the sources, the sources are slidable in a direction transverse to the conveying direction.

23.   An apparatus according to any one of claims 16-22, wherein the sources are tiltably mounted on the process chamber, such that the angle of

15   the plasma plumes relative to the substrate is variable.

24.   An apparatus according to any one of claims 16-23, provided with a control arranged for varying, preferably independently of one another, the arc flows of the various ETP sources.

25.   An apparatus according to any one of claims 16-24, provided with a

20   control arranged for varying, preferably independently of one another, the pressure of the carrier gas in the various ETP sources.

26.   An apparatus according to claim 17, wherein the measurement of the layer thickness is performed automatically.

27.   An apparatus according to claim 17, wherein the measuring device for

25   measuring the layer thickness variations over the surface of the substrate comprises an optical measurement device.

28.   An apparatus according to claim 17, the measuring device for measuring the layer thickness variations over the surface of the substrate comprises an resistance measurement device for resistance measurement

30   between two or more points on the layer.

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29.   An apparatus according to claim 17, the measuring device for measuring the layer thickness variations over the surface of the substrate comprises a layer thickness gauge.

30.   An apparatus according to claim 17, the measuring device for

5   measuring the layer thickness variations over the surface of the substrate comprises an temperature measurement device for temperature measurement of the substrate surface.

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